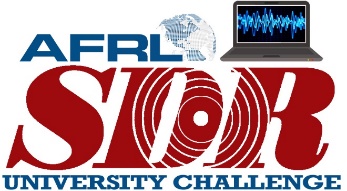
**AFRL Beyond 5G SDR University Challenge: Call for Participants**

The Air Force Research Laboratory (AFRL) in partnership with the Wright Brothers Institute (WBI) is sponsoring the fourth year of a student challenge focused on Software Defined Radio (SDR) and Software Defined Networking (SDN) technology.

The key goals of the challenge are to:

**1)** Utilize SDR hardware and development tools to encourage hands-on skill building and experiential student learning

**2)** Develop novel solutions to sensing and networking challenges using SDRs concepts

A video summary of the 2020 challenge can be found [here (YouTube](https://youtu.be/YSAxcVkbqEI)).

The challenge will run throughout the course of the 2021-2022 academic year (Sept. 2021 – May 2022) and is divided in two categories: constrained and unconstrained. The constrained category is targeted at teams that utilize the AFRL provided SDK kits (see below), while the unconstrained category is open to teams that introduce additional/more capable hardware.

AFRL provided SDR kit contents:

2x [NI USRP-2901](http://www.ni.com/en-us/support/model.usrp-2901.html): 70 MHz-6 GHz, 2-Channel, 56 MHz Bandwidth SDR

2x [VERT2450](https://www.ettus.com/all-products/vert2450/): 2.4 and 5 GHz Dual Band Vertical Antenna

2x [VERT900](https://www.ettus.com/all-products/vert900/): 824-960 MHz 1710-1990 MHz Dual Band Vertical Antenna

2x [VERT400](https://www.ettus.com/all-products/vert400/): 144 MHz, 400 MHX, 1200 MHz Tri Band Vertical Antenna

AFRL has teamed with NI to help provide [videos](https://www.youtube.com/watch?v=5thnCuWZBfk) and [learning tools](https://learn.ni.com/teach/resources/filter?catids%5B%5D=85&filter_ids%5B%5D=16&perpage=25) for participants to become more familiar with SDR hardware and concepts. In addition, teams have the option to engage the AFRL/NI team to provide project updates and received specific technical and programmatic feedback throughout the year.

After a two year virtual format, we anticipate the return to an in-person final challenge and showcase event in May 2022 (Dayton, Ohio). Top teams will be invited (travel reimbursement available) to demonstrate their skills and compete for prizes. Space will be provided for the teams to demonstrate and present what they have accomplished, interact with teams from across the country and practicing engineers/scientists from AFRL/Industry. Individual student participants may also apply for travel grants to present their results at a refereed conference.

Technical and programmatic questions may be submitted to Dr. Steve Hary, [stephen.hary@us.af.mil](mailto:stephen.hary@us.af.mil).

Team proposals will be accepted beginning 1 August through 30 September 2021. Proposals can be emailed to [bob.lee@wbi-innovates.com](mailto:bob.lee@wbi-innovates.com) or [Tony.lizza@wbi-innovates.com](mailto:Tony.lizza@wbi-innovates.com) for consideration. Attachment 1 is the proposal format for submission.

AFRL Beyond 5G SDR University Challenge Team Proposal

University(ies):\_Stevens Institute of Technology\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Professor(s):\_Kevin Lu, Yu-Dong Yao\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SDR Kit Requested: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Additional Hardware Requested: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team start date:\_9/30/2021\_\_\_\_\_\_\_\_\_\_\_\_\_

Student team (Name/Major/Year): \_Joshua Hwang / Electrical Engineering / 2022; Matthew Ross /\_\_ Computer Engineering / 2022; David Valle / Electrical Engineering/ 2022; Jackson Kent / Electrical\_\_\_ Engineering / 2022; Connor Eggert / Electrical Engineering / 2023\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Although the challenge highly encourages experiential learning and skill development for undergraduate students and is ideally suited for a senior/capstone design project, graduate student team members are also allowed. Similarly, although the work should be primarily accomplished by students, a faculty sponsor who is committed to guide and mentor the team is required to receive the SDR kits.*

**Proposed Goal:**

*Describe the overall project goal. Where possible provide specific quantifiable metrics and performance parameters you hope to achieve.*

*AFRL is interested in all aspects of SDR/SDN with a particular emphasis on radio frequency sensing and communications. Potential topics of interest include but are not limited to:* *Spectrum analyzer/auto spectrum sensing, Radar range/speed finder, Comm. Mesh network implementation, Freq hopping radar/comm, RF repeater, Antenna interface/control and Beamforming.*

*Examples of previous University Team projects include:*

* *Cross Layer Video Communication Over SDR*
* *Investigating Anti-Jamming on an LTE Network*
* *UWB, VWB indoor navigation*
* *Non-contact vital sign health monitoring using SDR Radar*
* *Cloud-based 5G spectrum observatory*
* *5G Mesh network for improve QoS UAV connections*
* *Vehicle-to-Bike Crash Prevention using SDR/GPS*
* *Dynamic jamming with incremental learning*
* *RF and optical physical layer security protocols*
* *Beamforming controls for spiral antenna array*
* *UWB Clutter-like Radar, OFDM implemented on SDR*
* *Beamforming, MIMO, Cooperative Radio using SDR*
* *GNU Radio set-ups for Radar, Comms, and Moving Target Sim*
* *Physical layer security using SDR*

**Development plan:**

*Provide a description of tasks and milestones that your team plans to accomplish within the academic year period. Describe your starting point and any previous work (SW/code, HW setup etc) that your team will leverage. It’s Ok if your team is new to SDRs in which case some early tasks will be learning/skill development oriented. The more detailed and well thought out your work plan and milestones the better chance your team has to be awarded an SDR kit. If you are asking for additional hardware/Software beyond the Base kits, provide justification and cost for those items.*